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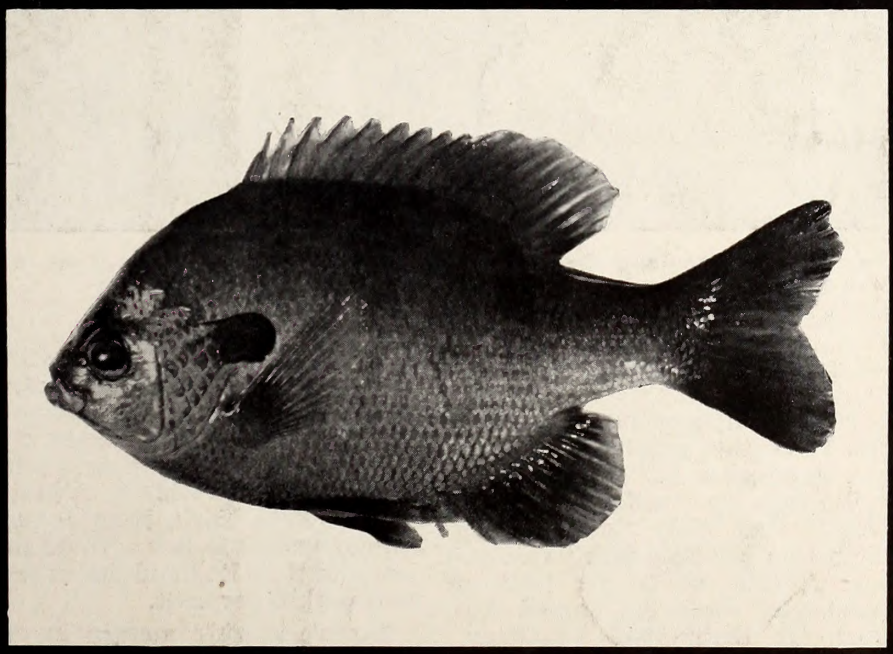
Wildlife
IN NORTH CAROLINA



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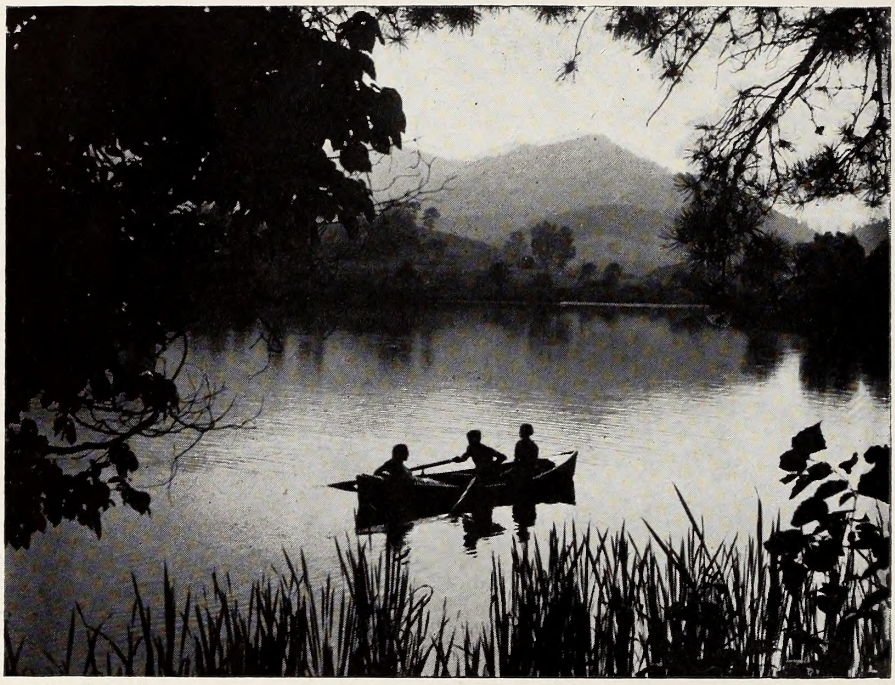
JULY 1948

VACATION TIME

July is Becoming the Most Popular Vacation Month. Spend Yovr Vacation in North Carolina



Seven and five-tenths per cent of vacationists will go boating. 67.9 per cent will go fishing.

(Reprinted from *Outdoors Unlimited*)

August always has been the No. 1 vacation month for American sportsmen, but a recent survey made by *Outdoorsman* disclosed that July is becoming almost as popular with vacationists. A total of 19 per cent of sportsmen contacted named August for their 1948 vacations, 18.7 per cent selected July. June was next with 13.3 per cent, followed by September with 9.5 per cent.

The average vacation party will be four (37 per cent) with two to a party second (25 per cent), and three next (14 per cent). Most all the vacationists will travel by automobile (86 per cent), with 5 per cent going by train and 9 per cent traveling by trailer, bus, airplane, etc.

Canada will draw the heaviest total with 17.5 per cent with the East North-Central States (Illinois, Michigan, Indiana) getting 17.2 per cent. West North-Central States (Minnesota, Iowa, Wisconsin, North and South Dakota, Nebraska, Missouri) rank next with 10.7 per cent. Middle Atlantic States (New York, New Jersey, Pennsylvania) follow with 8.4 per cent and New England States rate next with 8 per cent.

There's a wide margin in expenditures for vacations. The largest group (61 per cent) will spend $50-$250, followed with the next group (18 per cent) in the $300-$500 bracket. Eight and four-tenths per cent will spend between $600 and $1,600.

Fishing, naturally, will get the greatest play—67.9 per cent—with hunting enthusiasts making up 13.6 per cent of the total. Seven and five-tenths per cent will stick to boating. And cabins rank first in popularity for lodging with 50 per cent followed by 21 per cent who plan on camping out.

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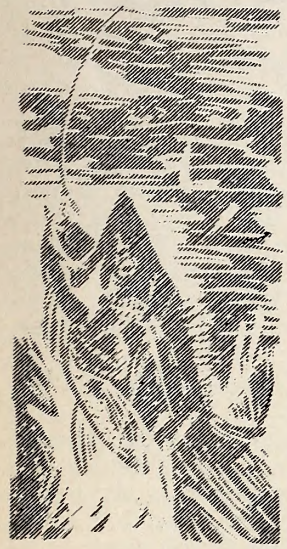
A bimonthly magazine devoted to the protection and restoration of our Wildlife Resources and to the improvement of hunting and fishing in North Carolina



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July 1948 **Vol. XII No. 4**

COVER

A good piece of goods should come in an attractive wrapper. The red border on WILDLIFE will be a trademark from now on. The fish pictured is a Bluegill, (or Bream) one of North Carolina's most popular fresh-water fish.

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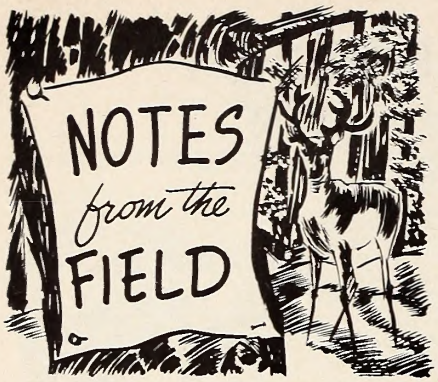
WILDLIFE IN NORTH CAROLINA recognizes the need for close cooperation between State and Federal conservation agencies and the people who hunt and fish—to bring about a restoration of our renewable resources. The Editor gratefully receives for publication all news items, articles, photographs, and other material dealing with the various activities which combine to make North Carolina a better state for hunting and fishing. Full credit is given for all material published.

Application has been made for entrance as second class matter at the Post Office at Raleigh, North Carolina, February 23, 1948, under the act of August 23, 1912.

SUBSCRIPTIONS—Fifty cents per year, one dollar for two years. Make remittances payable to WILDLIFE RESOURCES COMMISSION. Any employee of the Wildlife Resources Commission may accept subscriptions, or they may be forwarded to Postoffice Box 2919, Raleigh, North Carolina.

WE ARE GROWING! Thanks to the efforts of our own personnel and sportsmen's club officers who have given of their valuable time to solicit subscriptions, this issue is the largest ever printed in the history of the magazine. Beginning with the September issue WILDLIFE IN NORTH CAROLINA goes on a monthly basis.

ROD AMUNDSON, *Editor.*



A Biological Survey of Lake Waccamaw

By David G. Frey[1]

Introduction

Although Bladen County is most richly supplied with bay lakes of all the regions in the Atlantic Coastal Plain, adjacent Columbus County has one lake—Lake Waccamaw — which surpasses all the others studied thus far in fish production and fishing. In many respects it is like the Bladen County lakes already reported on,[2] but in other significant aspects it is very different.

Using outline maps obtained from aerial photographs made by the U. S. Department of Agriculture in 1938, the lake was surveyed with a boat and plane table, using an ordinary stadia rod for determining depth of water and type of bottom. A total of more than 500 soundings were made during the survey of this lake in August, 1947.

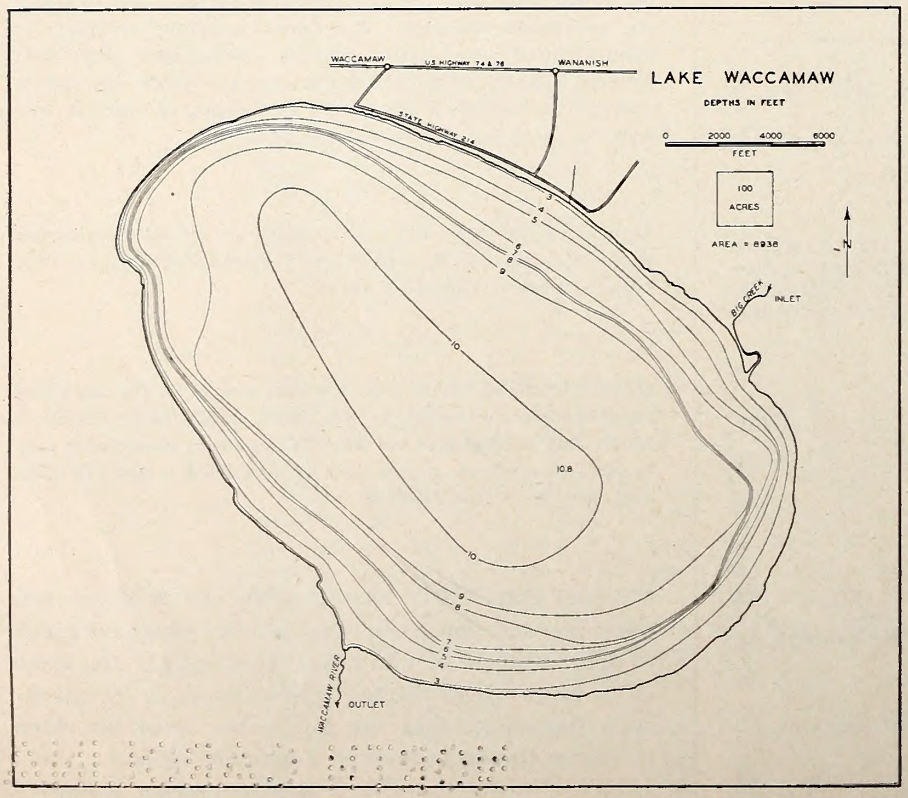
Concurrently with these hydrographic studies, or following them in some instances, observations were made on temperature, light peneration, oxygen content, and acidity; quantities of minute plants and animals living free in the water (plankton) or those living on and in the bottom (benthos) the kinds and relative abundance of fishes, and the abundance of aquatic vegetation. The methods used were the same as those previously reported.

Morphometry

Among the lakes in the eastern portion of North Carolina, Waccamaw is third in size, being exceeded only by Phelps and Mattamuskeet. Its area of 8,938 acres is more than six times greater than that of Black Lake, the largest lake in Bladen County, and its volume is nine times greater. Yet in spite of its size it is very shallow. The deepest sounding anywhere was only 10.8 feet. Hence, Waccamaw has about the same maximum depth as White Lake, but it is a foot shallower than Singletary. Its large size, however, enables it to have the greatest average depth—7.6 feet—of any of the Bay Lakes studied thus far.

When asked what the size of Waccamaw is, most persons living on its shores immediately reply, "Seven miles long by five miles wide." The survey showed, however, that the lake is more nearly five miles by three miles, with the maximum length being 5.3 miles. If one wished to hike around the lake he would have to be strong in leg and long in wind, since the total length of shoreline at the edge of the water is 14.2 miles.

Like the lakes in Bladen County, Waccamaw is enclosed in an oval basin elongated in a northwest-southeast direction, part of which has been filled in by encroaching vegetation. Waccamaw differs from these others in the small extent to which filling has occurred. Only 9 per cent of the original bay, as determined from the aerial photographs, has been filled in, and this is entirely at the northwest and southeast ends. Furthermore, both of these regions of fill have been cut off from the present lake by ridges of sand, providing a sand shore completely around the lake. Hence, except for the obstructions provided by the three inlet channels and the outlet, one could walk around the lake with a certain amount of wading in shallow water to get around regions of dense vegetation. The occurrence of sand all along the shore means that the process of filling in has probably been greatly curtailed, except when, as happened accidently only a few years ago, the lake level falls below normal for a long period. The results of this period of low water level are evidenced in a large population of young cypress trees growing in



[1] David G. Frey, Department of Zoölogy, University of North Carolina and Leader of Lake Survey Party; other members of the Lake Survey Party were: Edward E. Hueske, of the Wildlife Resources Commission staff, T. Stuart Critcher of N. C. State College, and A. Carter Broad, of the University of N. C. at Chapel Hill.

[2] See "North Carolina's Bay Lakes" in the May, 1948, issue of this magazine.

the shallow water along the southeast and south sides of the lake.

A large swamp area to the north and northeast of Lake Waccamaw drains into the lake by means of "Big Creek" and two smaller inlets. Strangely enough the depth of water in "Big Creek" only a few hundred feet from the lake is 16½ feet, almost six feet deeper than any part of the lake itself. A sand bar with only three to four feet of water over it separates the inlet from the lake. Normally one would not expect any portion of a tributary flowing into the lake to be deeper than the lake, and the reasons for the situation at Lake Waccamaw are not yet known.

At the southwest side of Lake Waccamaw is the outlet, in which a low concrete dam has been constructed to help control the lake level. As long as the spillway remains in working condition, the water level may rise above the crest, but will not fall far below it by evaporation alone. Only after periods of high water level when the water washes out parts of the dam or around the abutments is there any danger of a prolonged period of low water. Such occurrences should probably be avoided as much as possible because of the part they play in permitting new generations of cypresses to gain a roothold in the lake bottom.

Chemistry

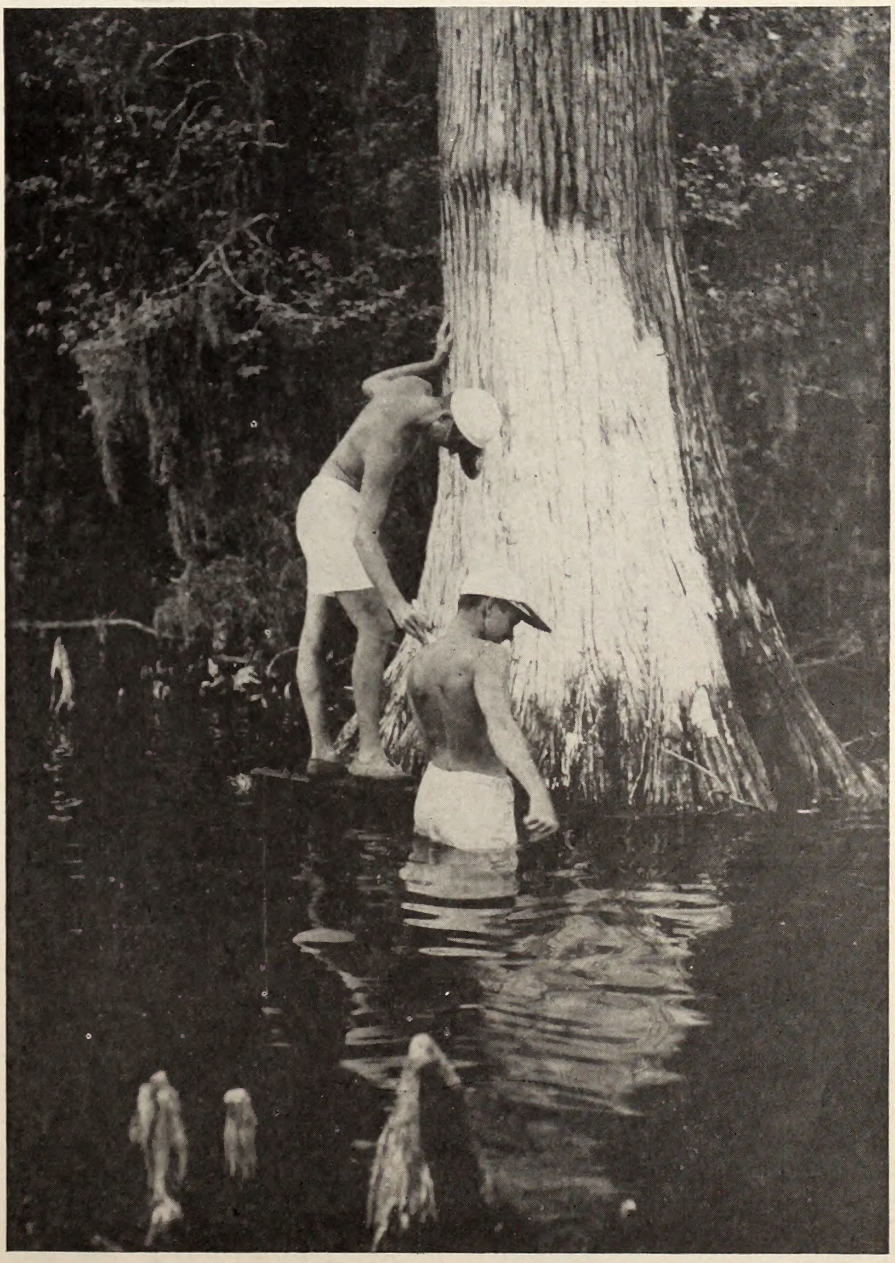
Water contributed to the lake from the swamp is acid (pH 5.2) and dark in color (400 ppm.), yet the water in the lake itself is nearly neutral in chemical reaction and is much lighter in color, and therein apparently lies a considerable part of the explanation for the greater productivity of Waccamaw, compared with the Bladen County lakes. The inlet water not only has an acid reaction, but it also has a considerable quantity of acid reserve, as measured by the amount of standard alkali required to cause a pink color with phenolphthalein. The high land along the north and northeast shores of the lake results from a geological formation containing a large amount of limestone, which neutralizes the acidity of the swamp water. This change in water quality permits more types of animals to occur and productivity to be greater. Similar calcareous formations do not occur along the lakes of the Bladen County lakes.

The color of Lake Waccamaw fluctuates widely. At the time of the survey the color was a rather light brown (159ppm.), about like that of Singletary Lake. On March 30, 1941, however, Hubbs and Raney[3] reported that the lake was almost colorless. The amount of color can be expected to influence the productivity through its effect on light penetration, since new organic matter can be manufactured by plants only where there is adequate light.

Sand not only extends all around the shore of Lake Waccamaw but also well out into the deeper water, in some places forming broad, sandy shoals. Because there has been no recent filling through the accumulation of deposits of vegetation originating outside the lake, the only other bottom sediment is pulpy peat. Sand comprises 64 per cent of the bottom, a considerably higher percentage than in any of the Bladen County lakes. This factor is important in helping explain the greater productivity of Waccamaw, since a greater abundance of bottom organisms is found on fine sand than on fibrous peat or pulpy peat.

Production

The neutral chemical reaction, the fairly good light penetration (as these lakes go) resulting from

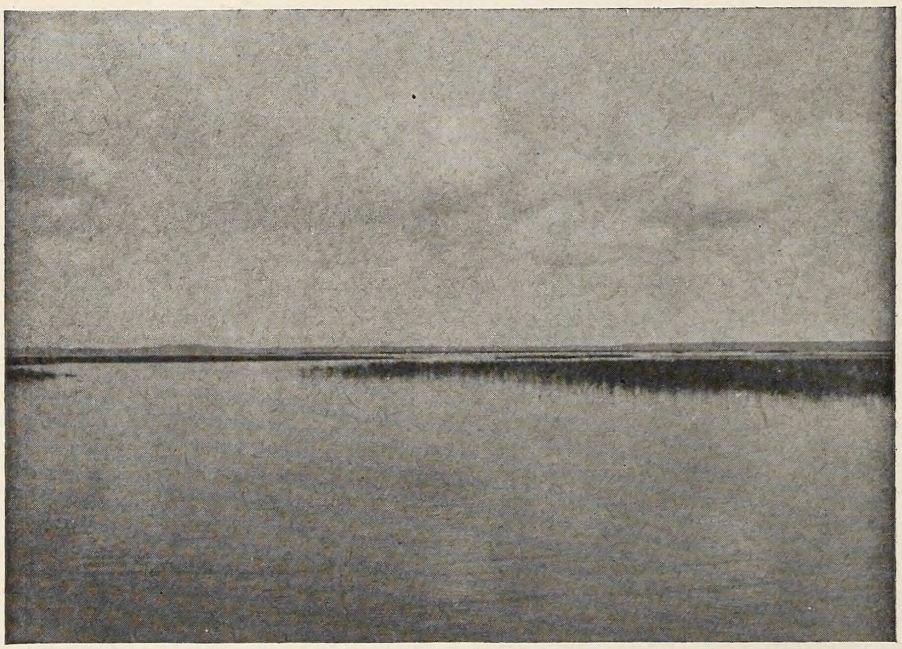


Members of the survey party establish a triangulation point for accurate measurement of Lake Waccamaw. Cypress trees such as this showed up on aerial photos, permitting accurate mapping of the lake.

[3] Hubbs, C. L., and E. C. Raney. 1946. Endemic fish fauna of Lake Waccamaw, North Carolina. Univ. Michigan Mus. Zoöl., Misc. Pub. 65.

a low to moderate color and a low turbidity, and the extensive bottom deposits of sand have contributed to a more extensive production of animal life in Waccamaw than in the other lakes studied.

First of all, Waccamaw is the only lake having a large population of mussels and snails on its sandy bottom. These organisms affect fish production by providing additional food, and also, in the case of the mussels, producing glochidia (a larval stage of the mussel), which parasitize the fish. These temporary parasites may be detrimental to the fish if abundant enough. Second, Waccamaw has rather extensive beds of vegetation, chiefly maiden-cane (*Panicum*), which extend almost 4,000 feet from shore in some places. These beds of vegetation provide some protection for the fish, and provide an increased amount of surface in the lighted zone of the lake for the production of fish food.



Maiden-cane beds such as this (at outlet) grow around the edges of Lake Waccamaw except at the deep northwest end.

Bottom Organisms

It is claimed that fish production is more closely correlated with the quantity of bottom organisms than with any other known factor in a lake. Hence, it is profitable to examine bottom production in some detail. Table I shows that the 28 bottom samples from Lake Waccamaw averaged 576 organisms per square meter (484 per square yard). Few bottom samples had the numbers of animals shown by the averages, because these organisms are not distributed uniformly over the bottom. For example, snails and mussels were concentrated in the sandy zone, whereas the mayfly nymphs were confined to the pulpy peat or to the deep water sand containing a considerable percentage of fine, black material. A brief comparison between the sandy bottom and the pulpy peat will show the greater value of the former in terms of total organisms produced. Nine sand samples averaged 993 organisms per square meter, as compared with 224 organisms for nine samples collected in the pulpy peat zone.

The generally better quality of the water for aquatic life in Waccamaw is reflected in the greater diversity of its fish fauna. Of a total of 27 species of fish collected in the bay lakes of Bladen and Columbus counties, 23 occur in Waccamaw, whereas White Lake with the next greatest number has only 17.

Eight species (longnose gar, gizzard shad, golden shiner, catfish, white perch, black crappie, pumpkinseed, and glassminnow) that were found in Waccamaw were not collected in any of the other lakes, and of these eight the white perch and black crappie are the most important fish in the lake from the angler's standpoint.

An interesting problem concerning the fish in Lake Waccamaw was pointed out two years ago by Hubbs and Raney in the paper previously quoted. There is such a large population of predacious fishes in Waccamaw (and there is evidence that the population has been larger in the past) that a great premium is placed upon the ability of small fishes to escape being captured. This has resulted in four new species of forage fishes developing in the lake during the relative short period of time that it has been in existence—a shiner, a darter, a killifish, and a glassminnow—all specialized in the same way for swimming rapidly by having a body more elongated and round than the species from which they are believed to have developed. This rapid rate of evolution has placed Waccamaw in the same exclusive class as a few of the large lakes in eastern Africa and one lake in the Philippines. Biologists are interested in the reasons causing such a sudden spurt in the usually slow process of species formation. Similar studies have not yet been made on the fishes in the Bladen County lakes, but it is interesting to speculate that perhaps a parallel evolution has occurred in them. They have a similar accentuation on predacious species. No mixing of fish can occur between the Bladen County lakes and Waccamaw, since they drain to the coast by entirely different river systems.

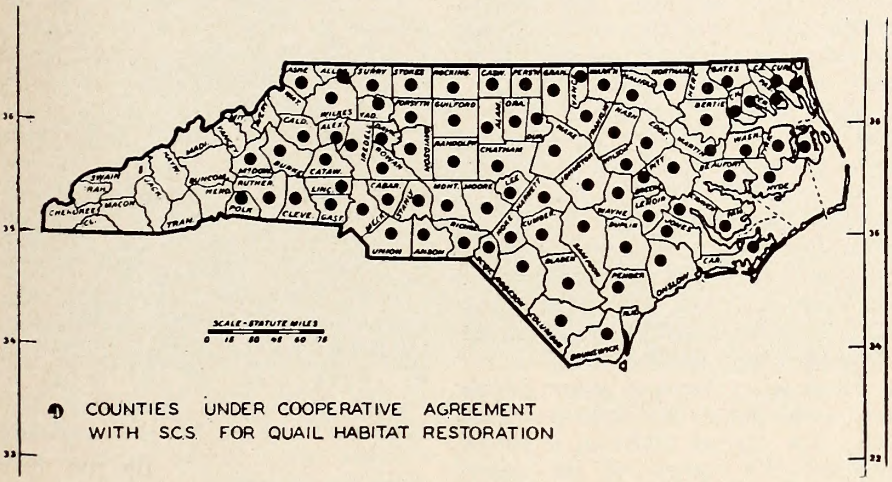
Summary and Recommendations

Lake Waccamaw is a bay lake like those in Bladen County, but is considerably larger than Black Lake, the largest, and differs in a number of important respects, which makes it more productive than the others. There is a greater diversity of the fish fauna, and fairly good fishing for white perch, black crappie, largemouth bass, and bluegills.

Because of its large size, Waccamaw would be difficult to manage by means of environmental controls. However, one thing which can be done is to maintain the spillway dam in working condition to provide a certain minimum lake level. This will help control the establishment of cypresses along the shore.

Recommendations regarding fish management are difficult to make because of extensive gaps in our present knowledge concerning the various species and the part they play in the general

(*Continued on page twenty-three*)



LESPEDEZA MEANS MORE QUAIL

Through a system of coöperation between the North Carolina Wildlife Resources Commission and the U. S. Soil Conservation Service, Tarheel quail and quail hunters are getting a break.

Under the direction of William E. McConnaughey, project leader of a Pittman-Robertson project carried on by the Resources Commission, more than 1,600 pounds of seeds and 1,000,000 seedlings of Lespedeza have been put out on farms over the State this year to provide late winter food for quail.

Game experts agree that most of this State has plenty of woody cover for quail habitat throughout the year, but there is a serious shortage of food for these game birds during the late winter and early spring months. It is for this critical period that efforts are being made to provide quail food through Lespedeza bicolor plantings.

Through a coöperative agreement between the Wildlife Resources Commission and the Soil Conservation Service, farmers who are already signed up for soil conservation practices are given Lespedeza seeds and plants to set out around the margins of fields. There is usually a strip of land between surrounding wooded areas and crop lands which does not produce enough harvest to replace seed used to plant it. It is from these strips that quail derive their benefit.

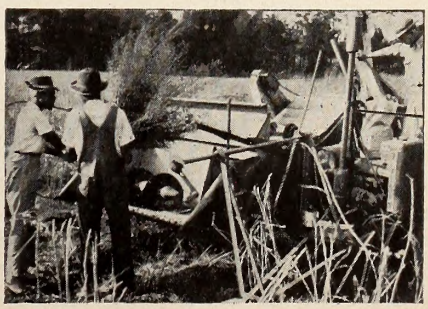
Winter Food for Quail

Lespedeza bicolor is planted nearest the wooded area, with a narrow strip of Lespedeza sericea next to the crop ground. Bicolor supplies winter food for quail, and sericea affords an excellent nesting area. The two types of Lespedeza, plus the field crops on one side and the woods on the other, afford ideal quail habitat.

Farmers in 80 counties are coöperating in the Lespedeza program. This area includes all but the mountain region and New Hanover County in the southeastern part of the State. Although it will take years to bring this program up to the point where the quail areas of the State will be blanketed by Lespedeza plantings, an immense amount of progress has been made since the project was established in 1944. Since that date over nine tons of Lespedeza bicolor and seven tons of Lespedeza sericea seeds have been planted over the 80-county area, plus 1,000,000 seedlings planted this year. A total area of 2,306 acres in field border strips has been planted.

The greatest limiting factor in the quail habitat restoration program is the extreme difficulty of harvesting Lespedeza seeds. Bicolor grows to a height of several feet on a tough, woody, shrub-like plant. Since it is too tall to be harvested in an ordinary manner, the seed stems must be broken off by hand and stacked on the branch stubs to cure. Once the seeds are dry, they are run through a stationary combine where they are threshed. Later

(*Continued on page twenty-one*)


Threshing Bicolor Seed

Water Wings—or Angel's Wings?

Some Reasons Why Vacations Too Often End in a Cemetery

By ROD AMUNDSON

Accidental drownings are going to account for 140 fresh mounds of earth in North Carolina cemeteries this year. Vacation trips, fishing and duck hunting trips will supply more than one-third of those graves and the corpses buried in them. This is

The Right . . .

perhaps a morbid way of expressing a serious thought, but there is nothing pleasant about sudden, tragic, unnecessary death.

Cold hard statistics show that an average of more than 140 people in this State die each year from accidental drownings. More than one-third of that total can be attributed to the misuse of small boats on inland waters. The sad truth is that most of these tragedies could have been prevented through the exercise of simple precautions.

Five hundred and eighty deaths during the 5-year period from 1942 to 1946 occurred from a variety of circumstances ranging from falling into wells to overloaded boats. This figure does not include suicide or homicide, each of which adds to the yearly toll.

Here are a few of the ways in which water tragedies occur, and how they can be avoided. Think them over carefully. They may save your life or the lives of people dear to you. Unless you choose to heed a word of warning, some sound advice may help — your heirs. Be sure that your insurance is in force before you go swimming, fishing, or boating. Your survivors, at least, will be grateful.

Most drownings occur in the old swimming hole. If you can't swim, don't go near the water unless you are with someone who can show you how, or at least pull you out. LEARN TO SWIM!

This warning is so old that it has almost become a cliché. But it is still sound: DON'T SWIM FOR AT LEAST TWO HOURS AFTER A HEAVY MEAL. Give your last meal a chance to digest before diving off the springboard. A sudden case of swimmer's cramps in deep water might make it *really* your last meal.

Swimming beyond your depth is just about as sensible as driving your car at night at a speed beyond the range of its headlights. It can be just as fatal. DON'T OVER-ESTIMATE YOUR ABILITY TO SWIM.

. . . and the wrong way to enter a boat from the water.

Tragedies resulting directly from the mis-use of small boats don't just "happen." They are caused. In every case they can be prevented and in every case they result from human carelessness or plain ignorance.

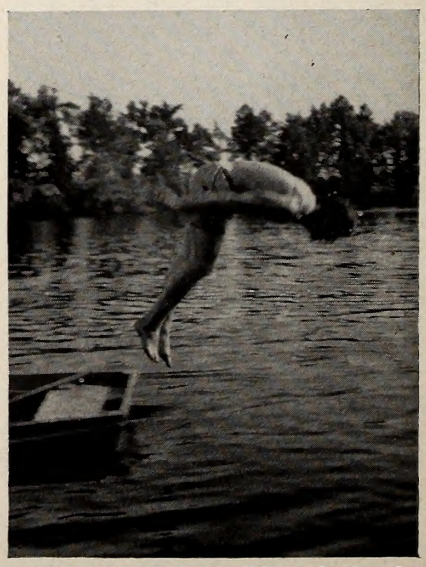
North Carolina has thousands of acres of deep-water lakes where none existed a few years ago. Vacationists and fishermen are attracted to these lakes with the inevitability of gravity. The sale of small boats has increased in proportion to the water. Those things add up to good outdoor recreation, and all too often, tragedy.

Small boats are fun, especially if they have a powerful outboard motor attached to them. But too many people fail to realize that operating a powerboat requires the same care and concentration demanded by driving a car down the highway. You meet the same type of people buzzing around on a lake that you encounter on the highway. You find the speeder, the reckless driver, the show-off, and the incompetent. All are equally deadly.

If you contemplate buying an outboard motor, or winning one on a radio contest, BE SURE THAT YOU MOUNT IT ON A HULL CAPABLE OF WITHSTANDING THE STRAIN OF ITS POWER. Lake bottoms over the country are dotted with rusty outboard motors still attached to the back ends of the boats to which they were mounted. The bodies of most of the careless owners came to the surface, and were recovered.

It seems superfluous to warn against hitting floating logs, snags, and rocks. Yet year after year on-the-water crashes occur with alarming frequency, resulting in the loss of expensive equipment and some legal action by local coroners. LOOK OUT FOR WATER TRAFFIC HAZARDS.

A small rowboat on the cool, placid surface of an inland lake seems about as tranquil as the comfort of the livingroom sofa. But don't go out even on a small lake without keeping an eye to



Do this only if your life is insured—or the boat is anchored.

Acrobatics in an over-loaded boat can be fatal. This picture was posed, but you can see the scene duplicated wherever people and small boats get together.

the weather. Sudden summer storms churn small lakes into frothing cauldrons. A pair of wooden oars are hardly a fit competitor to a 40-mile wind. DON'T TAKE CHANCES WITH ROUGH WEATHER. IF YOU GET CAUGHT, HEAD 'ER INTO THE WIND.

One of the most common causes of boat tragedies is by far the most unnecessary. A small boat has a definite load capacity, even on the smoothest water. Yet people insist on crowding into a small craft as though their lives depended on it, not stopping to reason that their lives may end with it. All goes well until a sudden gust of wind starts slushing water over the gunwales. Minnow buckets are fine for bailing out a boat, if there is room to do it. But most overloaded pleasure boats will probably have nothing more substantial to bail with than a summer straw hat.

Commercially built boats have a specific loading capacity. If your boat is a home-made job, use good judgment in the matter of loading. DON'T EXCEED LOADING SPECIFICATIONS unless you are ready to end it all.

Boats are designed for one single purpose: to transport people and goods over water without getting either wet. A leaky boat will keep neither you nor your equipment dry. Leaks must begin somewhere, sometime. It is embarrassing to have them occur while you are out on the water. It can be fatal. BE SURE YOUR BOAT IS SOUND FROM STEM TO STERN BEFORE GOING OUT ON THE WATER.

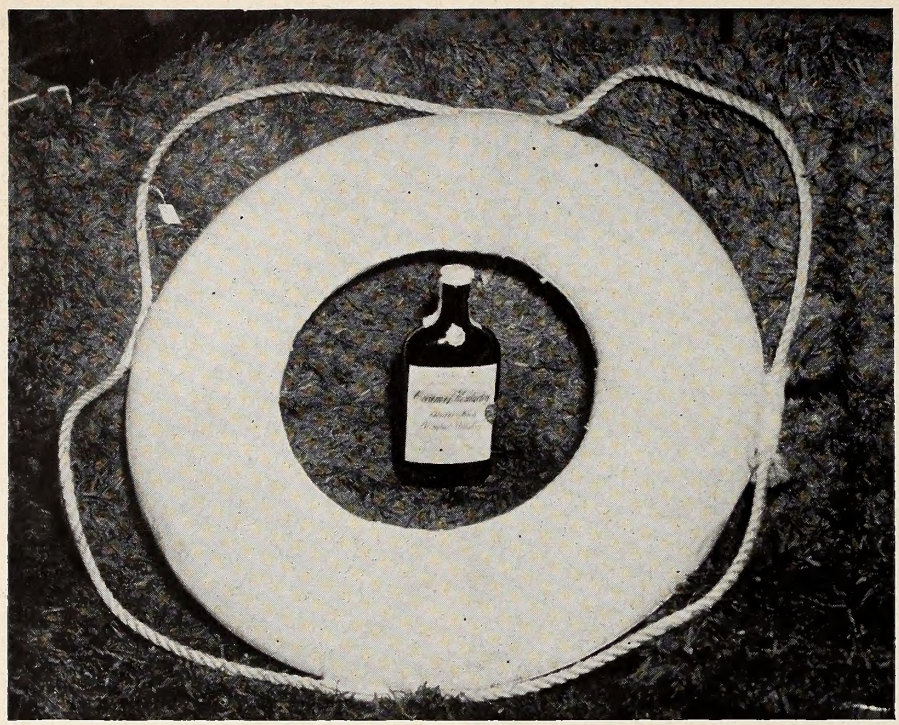
A small boat is no place in which to exhibit acrobatic talent, no matter how nimble and poised you are. Choose your seat and keep it. If you must change with someone, do it carefully, with as little rocking as possible. KEEP YOUR ACROBATICS ON DRY LAND.

Clear, cool water and a warm sun are a tempting combination for a summer swim. The fish may have stopped biting, and the water looks so inviting that you decide on a cool plunge. Very refreshing, but dangerous. Did you ever try to outswim an empty rowboat scudding along before a fresh breeze? DON'T GO SWIMMING FROM A BOAT UNLESS IT IS ATTENDED OR ANCHORED.

One of the most aptly named articles on your sporting dealer's shelves is the life preserver. It is also one of the most ignored. A life preserver is rather a cumbersome, bulky thing when you don't need it. But when you need it, brother, you *need* it!

If it were possible, this paragraph would be printed in large, neon letters. We will let italics suffice: *a good life preserver costs about the same amount of money as a bottle of liquor. Yet you would stand a good chance of doubling your money on a bet that you can find more small boats*

Joe Benson, Lewis, Inc., helps Gordon Finley, Flythe Sales & Service, into a cushion-type life preserver. (Photographic materials courtesy Lewis, Inc., and Flythe Sales & Service, Raleigh.)



A wise choice between these items can save a life.

equipped with a bottle of spirits than you will find equipped with life preservers.

There are two types of life preservers on the market ideally suited for small boats on inland waters. One type serves as a comfortable seat cushion until it is called into more vital service. Its kapok filler will support an adult in the water from 15 to 20 hours. Loops at either end of the cushion fit over the arms. This hampers swimming somewhat, but if you can't swim anyway, you will have plenty of time for hanging onto the loops. This type of preserver costs from $3.50 to $4.50 each. A small price indeed to pay for saving a human life.

The second type of life preserver costs a little more than the cushion variety, but is well worth the difference. It is built like a vest, and can be tied securely around the user's body. It too is lined with kapok, but has the added advantage of freedom of body movement for swimming. This type of preserver is especially desirable for power boat operators, who are more likely to be thrown suddenly into the water by a collision or a sudden turn. Power boats have the added danger of spinning, knife-like propeller blades. Sudden spills leave no time for threading arms through the loops on a cushion-type life saver. The owner of even the smallest power boat should never use it unless he and his passengers are equipped with vest-type preservers. One added advantage of this type is a pillow-like collar on the back. This comes in very handy by keeping the nostrils of unconscious or seriously injured passengers above water. The price range varies from five to seven dollars, depending on construction and materials.

Money invested in a life preserver can well be the best investment you ever made. DO NOT GET INTO ANY BOAT UNLESS IT IS EQUIPPED WITH THE MEANS OF SAVING YOUR LIFE.

Bear these few precautions in mind when you go boating or vacationing again. Your life may be at stake. And death is very, very permanent!

A crowded boat on still water near the shore may be safe; out on a lake in a sudden storm it spells tragedy.

Since this article was written three more graves have been placed in North Carolina cemeteries because of carelessness.

Death is very, very permanent.

NORTH CAROLINA WILDLIFE

RESOURCE-O-GRAM

A ROUNDUP OF THE LATEST WILDLIFE NEWS

EXECUTIVE DIRECTOR CLYDE PATTON HAS ANNOUNCED THE APPOINTMENT OF MR. WINFIELD DONAT OF HAMPTON, VIRGINIA, TO WORK AS A PUBLICITY SPECIALIST IN THE WILDLIFE RESOURCES COMMISSION'S EDUCATION DIVISION. DONAT IS A WILDLIFE ARTIST OF CONSIDERABLE FAME AND HIS TALENT WILL BE AN IMPORTANT CONTRIBUTION TO THIS MAGAZINE AND OTHER EDUCATIONAL WORK OF THE WILDLIFE RESOURCES COMMISSION. DONAT WILL BEGIN WORK ABOUT JULY FIRST. YOU WILL BE HEARING FROM HIM IN OUR NEXT ISSUE.

* * *

TWELVE ARRESTS WERE MADE DURING THE MONTH OF JUNE FOR DYNAMITING FISH. THE ARRESTS WERE A RESULT OF A CRACK-DOWN BY GAME PROTECTORS WHO RECEIVED COMPLAINTS FROM FARMERS THAT DEAD FISH WERE SEEN FLOATING DOWNSTREAM.

* * *

JULY 19 WILL MARK THE FIRST OF A SERIES OF CONFERENCES OF WILDLIFE RESOURCES COMMISSION PERSONNEL AND VARIOUS CONSERVATION AND LAND-USE OFFICIALS. THE PURPOSE OF THE CONFERENCES IS TO ACQUAINT COMMISSION PERSONNEL WITH LONG-RANGE OPERATIONAL POLICIES AND TO PERMIT A DISCUSSION OF FIELD PROBLEMS. THE CONFERENCES ARE TO BE HELD IN EACH OF THE NINE COMMISSION DISTRICTS, AND ARE CONSIDERED TO BE AN IMPORTANT STEP IN BRINGING ABOUT MORE EFFICIENT WILDLIFE RESOURCES MANAGEMENT.

* * *

EXECUTIVE DIRECTOR CLYDE P. PATTON HAS ISSUED AN APPEAL TO ALL SPORTSMEN TO ASSIST WITH THE WILDLIFE RESOURCES COMMISSION'S GAME AND FISH LAW ENFORCEMENT WORK BY REPORTING GAME AND FISH LAW VIOLATIONS TO THE NEAREST GAME PROTECTOR. PATTON SAID THAT GAME LAW VIOLATIONS MAKE NECESSARY AN EXPENDITURE OF OVER ONE THIRD OF THE COMMISSION'S BUDGET FOR LAW ENFORCEMENT WORK.

* * *

NORTH CAROLINA STATE COLLEGE NOW HAS 31 STUDENTS ENROLLED IN WILDLIFE CONSERVATION AND MANAGEMENT. THREE OF THESE STUDENTS GRADUATED IN JUNE AND HAVE ALREADY OBTAINED POSITIONS IN WILDLIFE WORK.

* * *

COMBINATION HUNTING AND FISHING LICENSES WILL BE READY FOR DISTRIBUTION ON AUGUST FIRST. COMBINATION LICENSES SELL FOR $4.10, A SAVING OF $2.10 OVER SEPARATE PURCHASES OF HUNTING AND FISHING LICENSES.

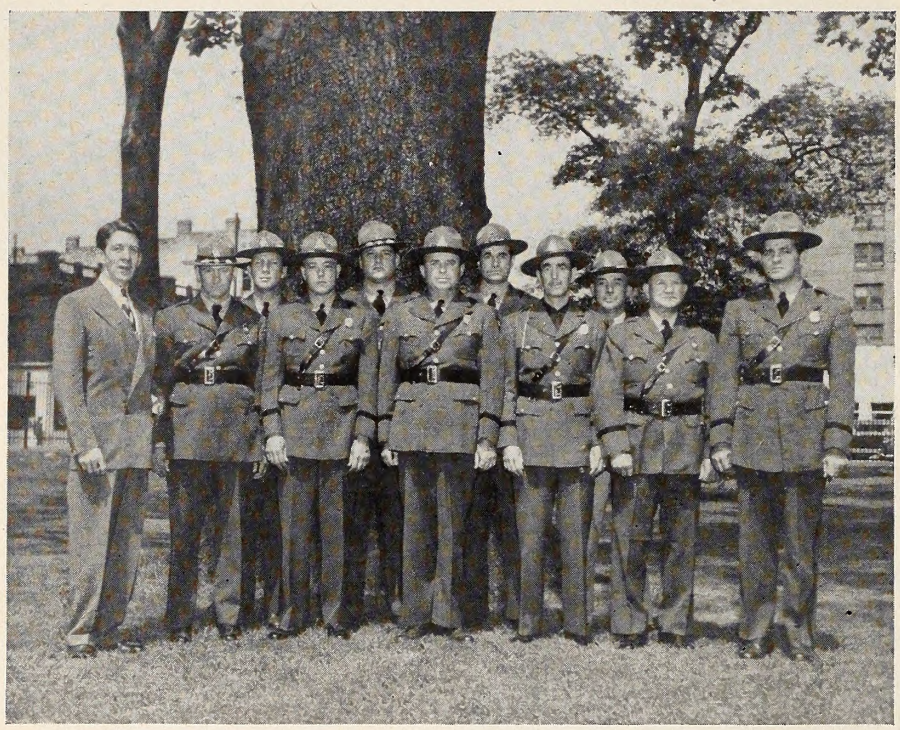
* * *

THIS ISSUE OF WILDLIFE IN NORTH CAROLINA TOTALS MORE THAN 8,000 COPIES, AN INCREASE OF 160 PER CENT OVER THE MARCH 1948 ISSUE, BUT ONLY .016 OF THE HUNTING AND FISHING PUBLIC IS ON THE SUBSCRIPTION LIST.

* * *

GAME LAW VIOLATIONS HAVE COST DELINQUENT HUNTERS AND FISHERMEN $7,936.42 IN FINES AND COURT COSTS DURING THE FIRST FOUR MONTHS OF THIS YEAR. ARRESTS FOR GAME AND FISH LAW VIOLATIONS TOTALED 1,330 DURING THAT PERIOD WITH 171, 225, 343, AND 591 ARRESTS DURING JANUARY, FEBRUARY, MARCH, AND APRIL, RESPECTIVELY. THESE FIGURES INDICATE THAT VIOLATIONS INCREASE IN PROPORTION TO THE NUMBER OF PEOPLE GOING OUT TO THE FORESTS, FIELDS, AND STREAMS.

Meet Your Law Enforcement Staff



Left to right: Clyde P. Patton, Executive Director; George Jarrett, Dist. 9; Raymond Watson, Dist. 2; Tom L. Rollins, Dist. 5; Homer L. Biggers, Dist. 8; Ed W. Caine, Dist. 4; William H. Norton, Dist. 3; Robert F. Logan, Dist. 7; Ben H. James, Dist. 1; C. Max Capel, Dist. 6; D. Warren Lupton, Chief, Enforcement Division.

The Wildlife Resources Commission has the responsibility of protecting the hunting and fishing privileges of the citizens of this state. This responsibility is placed in the hands of the law enforcement staff. To facilitate administration, the State has been divided into nine Commission districts as indicated on the accompanying map. Each county of the nine districts has a game protector, with occasional exceptions due to vacancies. Local game protectors work under the direction of District Supervisors, who in turn are responsible to the Chief of the law enforcement division. Warren Lupton, of Raleigh (see March 1948 issue) is the man directly responsible for all game and fish law enforcement in the State.

Game protectors are paid a salary from the game fund and provided with uniforms by the Commission. About one-third of the entire annual budget of the Wildlife Resources Commission is spent for law enforcement work.

Listed below are the law enforcement division supervisors and the county game protectors who serve under them.

District 1

Ben H. James, Supervisor, Williamston, N. C.

District Protectors:

- D. E. Barnes ..... Corapeake, N. C.
- Carlos Berry, Jr. ..... Swan Quarter, N. C.
- William L. Boswood ..... Maple, N. C.
- J. H. Bratten ..... Mann's Harbor, N. C.
- Cecil Ross Bullock ..... Robersonville, N. C.
- Arnold R. Dalrymple ..... Murphy, N. C.
- B. U. Evans ..... Grandy, N. C.
- Robert E. Evans ..... Edenton, N. C.
- E. L. Mosley ..... Columbia, N. C.
- Edgar Perry ..... Kitty Hawk, N. C.
- Lester A. Pierce ..... Elizabeth City, N. C.
- W. L. Smallwood ..... Windsor, N. C.
- J. T. Terry ..... Plymouth, N. C.
- James H. Vinson ..... Winton, N. C.
- Pinta D. Williams .....
- George E. Winslow .....

Distr

Raymond Watson, Supe

District Protectors:

- D. B. Bell .....
- Alex S. Davis .....
- Walter L. Heath .....
- Lonnie Koonce .....
- Floyd J. Lupton .....
- William I. Mallard .....
- Carlton R. Parker .....
- Sam Pope .....
- W. L. Rivenbark .....
- Herman K. Spain .....
- J. O. Teel .....
- Y. E. Warrington .....
- Henry B. Williams .....

Distr

William H. Norton, Sup

District Protectors:

- Henry C. Braswell .....
- N. B. Hughes .....
- J. Harold King .....
- Bob Dixon Perry .....
- C. M. Pettitt .....
- Alton D. Pridgen .....
- R. F. Wade .....
- Charles A. Warren .....
- William L. Whitley .....
- P. B. Wilson .....
- C. L. Wollard .....

Distr

E. W. Caine, Supervis

District Protectors:

- B. L. Boswell .....
- Leroy Bostick .....
- H. T. Bowmer .....
- Oscar Chadwick .....
- Sam Culbreth .....
- Pawnee Duvall .....
- Robert H. Hammer .....
- D. C. Hewett, ...
- Hugh V. Hines .....
- William E. McConnaughey .....
- H. R. McLean .....
- T. J. Turlington .....
- E. W. Woodell .....
- W. I. Wright, Jr. .....

Distr

Tom L. Rollins, Super
(P. O. B

District Protectors:

- Thomas Dewen Brummitt .....
- Jack W. Campbell, Jr. .....
- Maurice J. Daniel, Jr. .....
- John K. Davis .....
- L. R. Davis .....
- A. Eugene Jones .....
- Edward W. Lowe .....
- A. D. Neal .....
- Vance Perry .....

Distr

C. M. Capel, Supervis

District Protectors:

- S. M. Armfield .....
- Walter Bray .....
- Ed. W. Burt .....

.....Ocracoke, N. C.
.....Hertford, N. C.

T 2
isor, New Bern, N. C.

.....Kinston, N. C.
.....Marshallburg, N. C.
.....Snow Hill, N. C.
.....Richlands, N. C.
.....Pantego, N. C.
.....Maysville, N. C.
.....Pollocksville, N. C.
.....Magnolia, N. C.
.....Burgaw, N. C.
.....Stonewall, N. C.
.....Greenville, N. C.
.....New Bern, N. C.
.....Vanceboro, N. C.

r 3
isor, Smithfield, N. C.

.....Sharpsburg, N. C.
.....Jackson, N. C.
.....Smithfield, N. C.
.....Wake Forest, N. C.
.....Enfield, N. C.
.....Macon, N. C.
.....Henderson, N. C.
.....Goldsboro, N. C.
.....Tarboro, N. C.
.....Bunn, N. C.
.....Wilson, N. C.

r 4
, Lumberton, N. C.

.....Bolton, N. C.
.....Laurel Hill, N. C.
.....Southport, N. C.
.....Fayetteville, N. C.
.....Elizabethtown, N. C.
.....Ash, N. C.
.....Lumberton, N. C.
.....Whiteville, N. C.
.....Wilmington, N. C.
.....Red Springs, N. C.
.....Raeford, N. C.
.....Dunn, N. C.
.....Dublin, N. C.
.....Ingold, N. C.

r 5
or, Asheville, N. C.
7555)

.....Oxford, N. C.
.....Jonesboro, N. C.
.....Roxboro, N. C.
.....Asheboro, N. C.
.....Asheboro, N. C.
.....Siler City, N. C.
.....Durham, N. C.
.....Stokesdale, N. C.
.....Graham, N. C.

6
Mt. Gilead, N. C.

.....Marshville, N. C.
.....Rockingham, N. C.
.....Salisbury, N. C.

R. O. Caldwell.....Concord, N. C.
Alex Fields.....Southern Pines, N. C.
James B. Green.....Thomasville, N. C.
Paul L. Helms.....Albemarle, N. C.
Cleat Poole.....Troy, N. C.
V. D. Watts.....Morven, N. C.
J. D. Withers.....Charlotte, N. C.

District 7

Robert F. Logan, Supervisor, Statesville, N. C.

District Protectors:

George A. Barr.....King, N. C.
Joel Bently.....N. Wilkesboro
Dewitt T. Bryan.....Glade Valley, N. C.
W. F. Edmisten.....Boone, N. C.
Roland H. Koontz.....Jefferson, N. C.
Frank W. Mackie.....Yadkinville, N. C.
Ronda W. Pearson.....Taylorsville, N. C.
Hugh A. Robertson.....Statesville, N. C.
J. E. Scott.....Clemmons, N. C.
William A. White.....Rusk, N. C.

District 8

Homer L. Biggers, Supervisor, Morganton, N. C.

District Protectors:

Wallace M. Carpenter.....Three Miles, N. C.
J. W. Ellis.....Toecane, N. C
John T. Fairchild.....Conover, N. C.
T. W. Gowan.....Marion, N. C.
R. K. Harris.....Charlotte, N. C.
Clyde McLean.....Collettsville, N. C.
Charles W. Ormand.....Forest City, N. C.

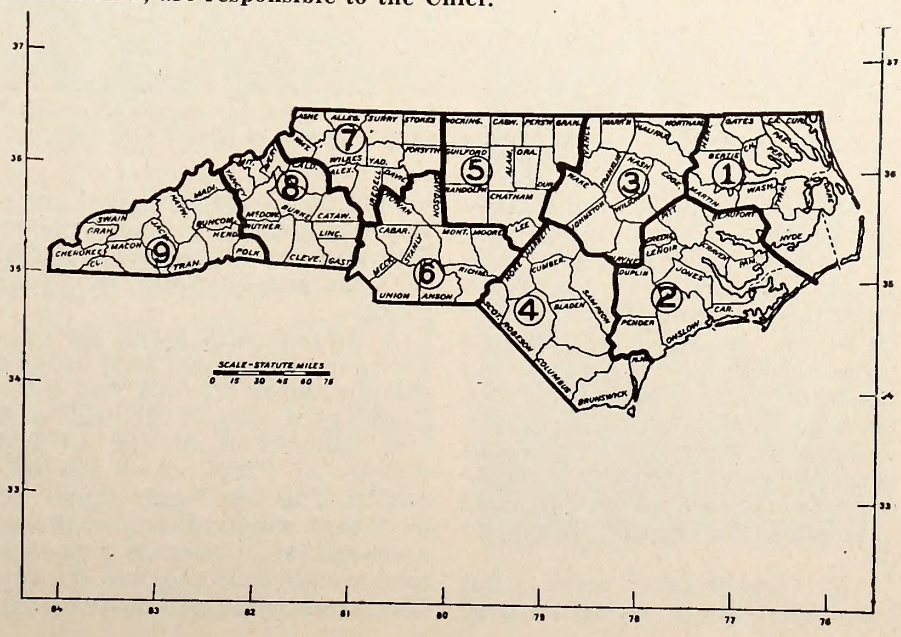
District 9

George C. Jarrett, Supervisor, Hayesville, N. C.

District Protectors:

Preston S. Bagwell, Jr.....Asheville, N. C. (P. O. Box 7555)
W. B. Cope.....Sylva, N.C.
Arnold Dalrymple.....Murphy, N. C.
C. L. Garland.....Robbinsville, N. C.
Arthur Pack.....Tryon, N. C.
Raymond C. Ramsey.....Mars Hill, N. C.
Daniel M. Taylor.....Lake Junaluska, N. C.
Perry D. Tipton.....Hayesville, N. C.
S. S. Whitaker.....Horse Shoe, N. C.

To coördinate law enforcement activity in North Carolina, the state has been divided into nine districts each of which is under the direction of a district supervisor. County Game Protectors are responsible to their supervisors, who in turn, are responsible to the Chief.



Fish On The Farm

Farm Ponds Can Produce 150 Pounds of Fish Per Year If Properly Cared For . . .

By Earl Franklin Kennamer

Reprinted Through the Courtesy of *The Farm Quarterly*

Busy farmers can find relaxation on their own land wit hout taking time to drive miles to public waters. This is a typical farm pond, one of many thousands to be found in N orth Carolina.

FARMERS like to fish if they can find time, but they seldom get away long enough to invade mountain streams in search of trout, or drift in a boat on a quiet woods lake. The best chance they have to enjoy the anglers sport is to have their own farm pond. If they manage their pond right there is always a spot close at hand where they can exercise a rod and reel for an hour or so when the evening chores are done.

The average farm pond is not large; perhaps it covers an acre of land. But a one-acre pond, properly cared for, can supply plenty of water for the stock, and fish for the family table the year round.

A farmer who gives his one-acre pond the proper care needn't fear an empty creel. A year after stocking he can, with hook and line, harvest from 150 to 250 pounds of "table-size" fish annually. This yield may consist of bass that weigh three-fourths of a pound to a pound and panfish that weigh three to five ounces. The annual yield will be about the same from a three-year-old pond, but then an occasional three-pound bass or twelve-ounce bream will add excitement to the catch.

While many ponds are built primarily for fish production, the purpose of most farm ponds is the conservation of water for livestock or irrigation. In ponds built as a source of water, fish are a secondary crop that can add food to the table and pleasure to farm life without damaging the pond for other purposes.

The three essentials of produc-

ing fish in a farm pond are building the pond, stocking it with fish, and managing it correctly once it is stocked. Good management of your farm pond includes fertilizing it, controlling the aquatic weeds, fishing it properly, and marketing or using at home the fish it produces.

There is no set size for a farm pond. A one-acre pond is big enough for the average farm. No fishpond should be smaller than a quarter-acre.

The essentials for a fishpond are a good source of water and a strong dam. In arid sections, ponds depending on run-off water from watersheds should be of a depth to maintain a supply of water the year round. Those ponds with a constant source of water, such as springs, should be at least six feet deep. To avoid winter kill of fish in Northern states, the depth of a pond should be 12 to 18 feet. Usually a pond has to be more than four feet deep to keep cattails out.

In northern regions where there are long periods of severe cold weather, fish sometimes die in shallow ponds if a blanket of snow covers the frozen surface. Death, however, is not usually caused by low temperature. The fish suffocate. The underwater plants through photosynthesis are the source of oxygen for fish in the pond. When a layer of snow persists over an icy pond surface, light is cut off from the plants and photosynthesis ceases. No oxygen is released, and the fish die. Where the ponds are deep, there is usually enough oxygen to keep the fish alive until the snow melts.

To give it strength the dam should be constructed with a 3-to-1 slope on the water side and a 2-to-1 slope on the opposite. A clay core is a must to prevent water from seeping out and making a puddle of your pond.

Bushes and trees should be removed from the site of the new dam and the land to be flooded. When a survey indicates that the pond will have a great deal of water less than one foot in depth, the proposed water level should be raised or lowered by altering the height of the dam, or by digging the pond deeper at the shoreline. Shallow water makes it difficult to control weeds and mosquitos.

A pipe should be installed so that the pond may be drained. A spillway will handle the overflow.

Because of the very great number of farm ponds being built in North Carolina, the Wildlife Resources Commission cannot supply fish for stocking ponds. Fish may be obtained from the federal government. Contact local SCS offices for information.

To protect the faces of the dam, sod it with Bermuda or centipede grass. It may be necessary to build diversion ditches on the fields above the pond to divert flood waters and help protect the pond from silting up and becoming a mud hole.

A horse-drawn slip scoop can be used to build a pond. Many farmers, however, are employing contractors with heavy scrapers and bulldozers for this work. With the use of such modern machinery, dams can be constructed for small ponds of one-half to one and a half acres at a cost of $150 to $300. The farmer can obtain aid in planning and building a pond from his county agent, the nearby vocational agriculture teacher, or a soil conservation specialist.

The present rash of pond building has resulted from the findings of fish research men. They have learned how to grow bigger fish in small ponds. We know now that an acre of freshwater will produce human food on a par with an acre of cultivated land. For example, where an acre-pond has produced 400 to 500 pounds of fish annually, food crops grown on one acre of land will produce 500 pounds of pork or 200 pounds of beef in a period of one year.

This increase in freshwater fish production is news in this country. Europeans, particularly the Germans, have for years used sewage and grain foods for feeding fish to obtain greater yields. The sewage disposal plant of the Speicher See in Bavaria is said to have produced up to 800 pounds of fish to the acre in one year.

All these foreign experiments have been carried out with carp, which, though considered an important meat fish in other nations, doesn't appeal to the American palate.

The Alabama Agricutulal Experiment Station is the pioneer in experimental work to determine how to increase production of fish in a farm pond at a reasonable cost. In ponds which once produced 40 to 200 pounds of fish to the acre each year, the yield has been tremendously increased. In Alabama they learned that a bass that required two to three years to reach a weight of one pound in unmanaged waters, can now gain that much in one year where the pond is managed properly.

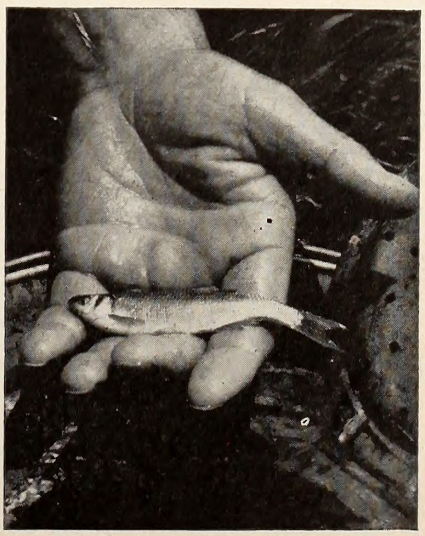
There is a story behind this research. Lake Auburn, owned by faculty members of the Alabama Polytechnic Institute, was to be stocked, yet no one knew how to do it best. There were no authoritative recommendations on record. Dean M. J. Furchess, director of the station, asked for an appropriation to carry on experimental fish work. He then appointed H. S. Swingle, fish culturist, and Dr. E. V. Smith, botanist, to spend their time in fishpond research.

In 1934 they started out with 20 experimental ponds. They had no reference material on which to base their experiments — only initiative and perseverance. It was a proposition of trial-and-error. It was tedious because experiments with living things take months, and even years.

Fertilizing for Fish

Uppermost in their minds was a question: "If fertilizer increases yields of crops, and hence livestock food, wouldn't it do as much for fish?"

They began to use different fertilizer combinations in ponds. Some proved to be worthless, others too costly. They tried various combinations of fish, often with disheartening results. They



Minnows such as this play an important part in fish production in a pond. (Photo by Rex Gary Schmidt.)

A secret of successful fish production in a farm pond is the judicious application of fertilizer. (Photo by Joe Munroe, Courtesy of "The Farm Quarterly.")

removed weeds from some ponds and planted weeds in others to see what effect these would have on fish populations and on the supply of oxygen added to the water.

Finally in 1938 these two scientists listed their results and found they had made startling progress in spite of their mistakes and failures. Within four year's time, they had accomplished more towards ferreting out fish facts than has been done in all the years of theorizing since the days of Izaak Walton.

Their findings and recommendations, first published ten years ago, were briefly as follows:

1. Best growth and size of fish depends on the number of fingerlings stocked initially in a pond.
2. Two species of fish must be present. One must be a predaceous type, such as the bass, so that small fish will not overpopulate the pond.
3. Commercial fertilizer will triple and even quadruple the growth of fish in a pond.
4. Weeds are a nuisance in any pond in which fish are to be stocked.

These discoveries added impetus to fish pond projects in several states. Ten years ago Alabama had 1,000 farm ponds. Now there are over 5,000.

Frank C. Edminister, Chief, Regional Biology Division, Soil Conservation Service, Darby, Penn., states that 1,423 ponds have been built in the 12 northeastern states under the supervision of his department.

The State Soil Conservation Committee in West Virginia prints a bulletin on farm ponds. Tennessee Extension specialists publish a similar booklet. Another is Circular 276 issued by the Extension Service at Clemson Agricultural College, South Carolina. Michigan State College and the West Virginia Agricultural Experiment Station are beginning fishpond management and fertilization experiments.

How Many Fish Per Acre

In planning a new pond, the area to be covered with water should be measured since recommendations for the number of fish required is determined on an acre-basis. An acre of water will support a limited weight of fish. If too many small fish are put into a pond they will be approximately the same size three years later, but if stocking is properly done the fish can grow to eating size. In one experimental pond overstocked with 6,500 bluegill fingerlings, the average weight of each fish three years later was .9 ounces. In another pond which had the number of fish reduced to 3,200, the average weight of each firsh was 1.8 ounces. A third pond with the number of fingerlings reduced to 1,300 an acre produced fish averaging 3.7 ounces each.

Planting the Fish

A combination of species of fish in a pond is necessary for growing larger fish. In one experiment where bluegills only were stocked, growth a year later was only 2.5 ounces. At the end of the year spawning occurred and each pair of bream was blessed with an average of 4,000 young. When the pond was drained five months later, the original bluegills had lost one-third of their weight recorded before spawning This loss was due to overcrowding.

To prevent concentration of numbers and therefore promote best growth, Swingle and Smith found that a combination of bass and bluegill fingerlings was best. Where they were used in correct proportions, bluegills gained an average weight of 3.7 ounces within a period of eight months. The bass ate many of the bream, especially those spawned in the pond. The bass grew larger, and the bluegills, reduced in number, had more food and added weight.

Where ponds are to be regularly fertilized, the U. S. Fish and Wildlife Service recommends 1,000 bluegill and 100 largemouth bass per acre. This ratio is satisfactory in practically any pond suitable for growing fish. In the South, Swingle recommends 1,500 bluegills to 100 bass. This higher rate is possible because of the greater productivity of southern ponds. In ponds which are not to be fertilized regularly because of prohibitive costs or because of continual muddiness, the rates for stocking are not more than 500 bluegills to 50 bass for each acre. Good results have been obtained with 400 bluegills to 30

bass in each acre of unfertilized water. In unfertilized ponds properly stocked, the growth of individual fish will be about the same as the growth of fish in fertilized water.

Fish should be carefully counted when they are stocked. This may be done with a small dipper as the fish are taken from the can in which they are shipped.

Bluegill fingerlings may be placed in the pond in the summer, fall, or winter and bass, the same fall or winter. If the bass are to be introduced the following spring, fry should be used. Fry are newly hatched fish, while fingerlings are young fish more than one inch long. According to the Fish and Wildlife Service, both species of fish may be stocked at the same time, but the fish should be as uniform in size as possible. Stocking adult fish is not a good idea. Fingerling fish may be obtained through the county agent, SCS, or the U. S. Fish and Wildlife Service, Washington, D. C. Sources of fingerlings are state and federal hatcheries. In some states fingerling fish are free; in others the pond owners must pay for them.

The first fertilizer application should be made after the fish are in the pond. When the water is fertilized before the pond is stocked, predacious insects may congregate and feed on the fingerlings or fry as soon as they are put in the pond.

Catfish, crappie, and shellcrackers have proved fairly successful in combinations with bass and bluegills, but these variations differ with the locality.

When transferring fingerlings from the fish truck or can, the temperature of the water in the container should be about the same as that of the pond. If there is a big difference in temperature, water from the pond should be added to the container in small quantities at intervals of several minutes in order to slowly equalize the temperature. This step will sometimes take 30 minutes in cases of extreme temperature differentiations, but it should be done, or many fingerlings will die from shock.

Screens of quarter-inch mesh should be placed against the spillway to prevent stocked fish from leaving a new pond. Debris will have to be removed from the screen periodically. The screens may be taken away when the stocked fish have become adults.

Mosquito Control

State health departments in many southern states require *Gambusia* minnows to be placed in a new pond in addition to game fish species. These minnows assist in control of mosquitos if the pond is clear of weeds and floating matter. Small and pot-bellied, these top-water fish, which can usually be found in most old ponds in the South, reproduce rapidly. They consume mosquitos and their larvae and also serve as food for bass in the season the bass are stocked. After that, young bream will take over the task of mosquito control and Gambusia are then unnecsary.

Fishpond owners should not stock rough fish, such as roaches, suckers, dogfish and carp, which muddy the water or take the place of those that offer better food and sport.

One farmer closely followed recommendations of the county agent in building his pond. After that, however, he went on his own. For his fish he seined nearby streams and old ponds and dumped huge numbers of fish of all kinds and sizes in his new pond. Two years later he admitted defeat, drained his pond, and started afresh; but this time he followed stocking directions.

Old ponds frequently show the ill effects of improper stocking. An old pond is overcrowded if most of the bream are small and thin. This indicates there are insufficient bass to keep the bream in check. To correct this fault, 100 bass fingerlings for each acre should be added.

The opposite situation occurs where most of the bream are large and the bass small and thin. In this case the pond was initially overstocked with bass. Correction here is difficult. The best method is to fish heavily for bass or to seine out the bass and then fertilize properly.

Only in extreme cases should a pond be drained to correct its faults. This is generally necessary, however, when the pond has become infested with too many rough fish, which probably came from the stream running into the pond.

How to Use the Fertilizer

Fertilization of ponds is being carried on in practically every state. Fertilizer can be used for three purposes: increasing growth and total yield of fish, controlling underwater weeds, and clearing ponds temporarily muddied.

How does fertilization affect the growth and fish life in a pond?

Plants furnish food for animals. Plants manufacture food and release oxygen, without which all animal life would perish.

Just as cattle existing entirely on pasture gain weight while grazing on fertilized fields, fish in a pond also have more to eat when a pond is fertilized.

In a pond, fish can be considered livestock that pastures on minute water organisms. These tiny organisms are plants. Countless small animal organisms eat these plants. The animal organisms serve as food for smaller fish, which in turn, are food for larger ones. So that by fertilizing the plant life the fish ultimately will benefit.

Fertilizer application to a clear pond produces phenomenal results. Within a few days the water will turn a rich deep green or brown. This color, which is due to great numbers of water plants, may get so dense that little is visible below the water's surface.

Swingle and Smith recommend two types of fertilizer for ponds. One consists of a mixture of 100 pounds of 6-8-4 and 10 pounds of nitrate of soda for each acre. The other, which is recommended when 6-8-4 is not available or when a great quantity of fertilizer is required, is made up of the following for each acre: 40

Farm ponds are an ideal recreation spot for the younger generation.

pounds of sulphate of ammonia, 60 pounds of 16 per cent superphosphate, five pounds of muriate of potash, and 15 pounds of finely ground limestone.

Each of the above fertilizer combinations and amounts constitute one application. The U. S. Fish and Wildlife Service recommends 100 pounds of an 8-8-4 formula per application. This is the approximate equivalent of 100 pounds of 6-8-4 plus 10 pounds of nitrate of soda. The first application should ordinarily be made early in the spring when the weather gets warm. When a depth of 12 inches can be seen in the water, it's time for a second application. Ponds riled by flood waters should not be fertilized until flood danger is reduced. This is usually late in the spring.

For best results six to ten applications will be necessary during the growing season every year. Where the overflow is small, less fertilizer will be required than in ponds that have a large amount of water pouring over the spillways.

It's easy to fertilize a pond. If the pond is small, the fertilizer can be distributed by hand. There need be no attempt to put it in the middle of the small pond because wave action will carry it out.

In large ponds of four or five acres, fertilizer can be spread from a boat.

Where clear water predominates in old ponds, fertilization will generally show a tremendous improvement in fish growth if followed at the rate prescribed for new ponds. The fish will increase in weight from three to five times.

Old ponds that are always muddy should not be fertilized. Fertilizer is of little benefit in any pond which loses a large amount of water during the growing season. Where fertilizer cannot be used, better fishing can be expected if the pond is drained, the fish removed, and the pond correctly re-stocked..

Barnyard manure is not recommended for any pond. A ton of manure will produce only about 40 pounds of fish.

Manure, however, is used for clearing water that is temporarily muddy due to wind action, heavy rains, or recent construction. A ton to an acre, applied two or three times at three-week intervals, will usually clear the water. A commercial mixture of 75 pounds of cottonseed meal and 25 pounds of superphosphate to the acre applied at two to three week intervals will also do the job, and in addition, will stimulate fish production. After the water has cleared, start the regular fertilizer program.

Weeds Are A Headache

When Swingle and Smith began their experiments, pond weeds were considered good for the fish. Weeds were valued as a necessity for protecting fry. Experiments exploded these age-old theories.

Weeds are now regarded as pests in the pond the same as in the garden. They occupy space which could be used by fish. They snarl fishing lines. Weeds above water prevent free fishing from the bank and hinder effective mosquito control. True, they protect smaller fish from larger ones, but this often leads to overcrowding and stunted fish. It is a mistake to introduce water lilies and other flowering plants; you may sacrifice fish for beauty.

There are three types of weeds —submerged, emergent and floating. Submerged weeds, or those that grow entirely underwater, can be controlled in both old and new ponds by commercial fertilizer. The fertilizer so increases the microscopic plant growth that its density makes a shade and prevents growth of submerged weeds. The best fertilizer is the mixture of 100 pounds of 6-8-4 and 10 pounds of nitrate of soda for each acre per application. This fertilization should begin while the water is still cold just before the weather begins to warm up in early spring.

Broadcast the fertilizer over the weed-beds. Following the first application, two more are made at two-week intervals. Further applications are made three weeks apart until the weeds become covered with algae or "pondscum."

Afterwards, the stems break and the weeds float to the surface. When large masses of these weeds and scum cover the water, usually during spring and early summer, no additional fertilizer should be applied. At this time the weeds are decaying rapidly; additional fertilizer may cause too rapid decay, which will exhaust all oxygen in the water and eventually suffocate the fish. The decaying plants will release nutrients to the water to promote plankton growth and in some cases no more fertilizer is required for the remainder of the year. Fertilization, however, should be resumed when objects can be seen in water 12 inches deep.

Emergent weeds, such as spatterdock, yellow waterlilly, common waterlilly, lotus, or water chinquapin, watershield, and floating pondweeds, should be removed by hand from the new pond when they appear. A garden rake is often handy for this purpose. In old ponds this type of weed may also be removed by hand or cut as often as it appears. Draining a pond to kill weeds is not recommended. Sodium arsenite and copper sulphate solutions are suggested by the Fish and Wildlife Service specialists for weed control. Use of these chemicals, however, entails a possible risk of killing fish. The new weed-killer, 2,4-D, may prove effective in pondweed control in the future. Its results are being studied at the present.

Cattails, bulrush, needle rush, and spike rush form dense growths in shallow water and should not be permitted in either new or old ponds. Water hyacinth and the true floating weeds, such as duckweeds, should also be removed.

Then Go Fishing

In a new pond that has been stocked and fertilized you can start fishing toward the end of the first year. This permits remaining fish to grow to a larger size.

A comparison with a field crop will give the picture. If corn is thickly planted in rows close together and not thinned, stalks will be stunted, and the yield will be nubbins. If the corn, however, is planted in wide rows and thinned intelligently, big healthy stalks heavy with long ears can be expected. When not crowded, each stalk has access to a plentiful supply of nutrients.

If no fish are removed from a fishpond, growth of individuals will be slow. "Thinning out the fish" with hook and line will enable the remaining fish to grow larger because more food is available.

One of the first questions that comes up is how much fishing should be permitted? Only 50 to 60 per cent of the total weight of fish in a pond should be removed each year. It has been discovered, however, that heavy fishing can account for this percentage in a short time. Fishing and amounts

of fish taken from a pond should be regulated to spread the sport over the entire season.

In all ponds there are cycles of good and poor fishing. Fishing is better when the food is scarce in a pond. When a large number of fish is taken out, the food remaining in the pond will be so abundant that the angler's bait will be ignored. Later, when the natural food in the pond has been consumed, fishing will again improve. This accounts for cycles in good fishing. The expert fisherman can usually have "good luck" in poor fishing periods by varying his lures. Then, of course, there is always the fellow with the "fishing touch" who can bring home a string of fish on a day "when they aren't biting."

Although some state conservation laws now permit owners of private ponds to sell freshwater fish legally on the market as food, most farmers prefer to make their profits through the sale of fishing permits and rights. Last year fishing rights to 70 ponds in one southern state amounted to $23,714.

A. C. Whatley has a 200-acre farm near Muscle Shoals, Alabama, on which he built a small fishpond a few years ago. The pond is approximately an acre in size. He stocked it with the proper number of bluegills and bass. Every year he fertilizes it.

To make the pond pay in full in recreational opportunities, he constructed a lodge for himself which is a sportsman's dream. Located beside the pond it is fringed with tall whispering pines. The lodge has running water, a bathroom, and electricity. It makes a good place for farmers' community meetings. When the group gets tired of talking they can always change into bathing suits, dive in and cool off.

The fruits of a well-managed pond. Proper management of a pond will produce healthy fish like these crappies and black bass. (Photo courtesy Soil Conservation Service.)

The Rules Are Changing

Some states have now removed all restrictions on size and number of fish which can be legally kept. This radical change is explained in the fact that taking of small fish has little effect on the total supply. Sportsmen in the future may throw away their rulers. In addition, there are experiments under way with year round open seasons.

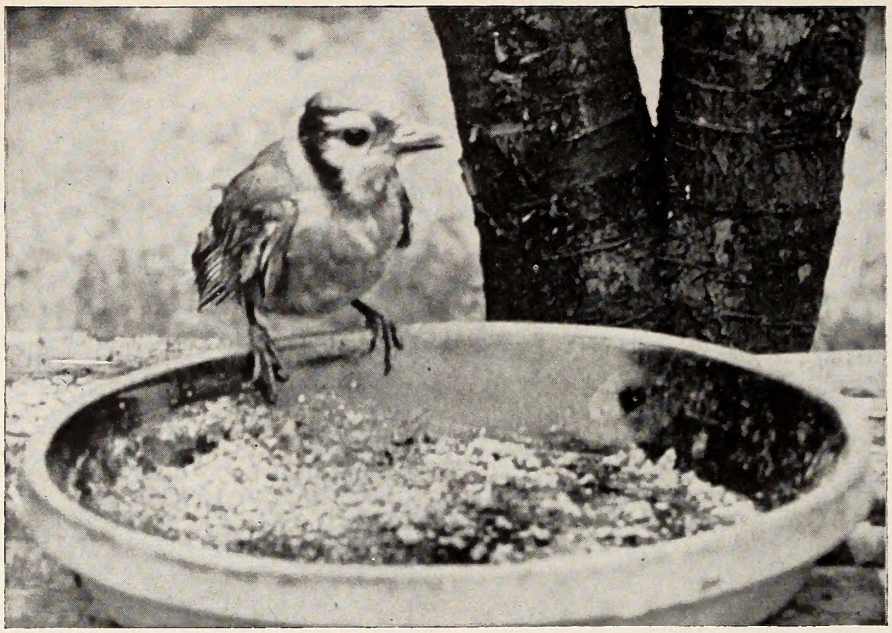
Farm ponds are proving valuable in many ways. During times of high water, fish from stocked ponds go over spill-ways into the pools and rivulets below. In one experiment 6,882 small fish left a 1.5 acre pond in a period of eight months. Sometimes large fish go over the spillway along with the fry, to restock the streams below.

Some farmers are planting their gardens below pond dams, for moisture due to seepage is sufficient to keep vegetables well supplied in months of drought.

Many farm ponds which were built to supply water for livestock or orchard spraying have become just one more way to keep the children happy and satisfied with farm life. And as one old farmer in central Missouri said recently: "It's not a bad idea at all to have a spot on your own land where you can take a one hour vacation whenever you feel like and be pretty certain you won't have to come back and explain why you didn't catch any."

L. B. Tunnell, Refuge Manager of the Lake, Mattamuskeet area, New Holland, reports some excellent jumping mullet fishing in that area. On May 15 a party of five fishermen caught a total of 240 mullets, an unusually large mullet catch. The fishermen were: Arvil Walser, Hugh Walser, Bruce Walser, Bennie Walser, and Hobert Livengood, all of Route 3, Lexington, N. C.

Biologists have learned to tell the age of fish which have scales. Most scaled fishes lay down annular rings on their scales similar to the rings in trees. During winter months scale rings are incompleted due to a slowing down in feeding and growth. By counting regions of incomplete rings it is possible to determine the number of seasons through which fish have passed.



The Tragedy of a Blue Jay

TWO NATURE SHORTS

By JACK DERMID

My experience with Saucy, a young blue jay that did not reach maturity, has taught me a lesson which, I think, should be recorded as a maxim: Leave the young of wild creatures alone! And Saucy's brief biography illustrates the significance of such a statement.

Saucy came into my life one spring day while I was photographing a family of blue jays in a local park. Just as I focused my camera on the nest, this tiny nestling squawked mightly, rose on its feeble legs, and then tumbled to the ground below. After returning it to the nest several times, only to have the performance repeated, I decided to attempt to raise the young bird myself, hoping to make a pet of it as others have done with crows.

Somewhat frightened at first, Saucy soon accepted the cage on the back porch as home and resigned itself to a life among men. It thrived upon an omnivorous diet of insects, bananas, ground beef, bread, milk, and dog food. After its tail feathers had elongated sufficiently, Saucy instinctively learned to fly; but, alas, without the aid of the parent birds, its education did not progress much further.

After several days, I released Saucy in the backyard, giving it the freedom of the neighborhood. With water and food provided, the young blue jay learned to drink by itself, but did not ever learn to use its beak satisfactorily for feeding. Nearly every time someone entered the yard, Saucy flew to his hand or shoulder and begged for food. It also depended upon man for companionship. Although blue jays were common in the vicinity, Saucy did not associate with them.

The young jay's dependence upon man led to its untimely death. Without wise parents to teach it the meaning of danger, Saucy could not distinguish friend from foe, and soon fell an easy prey to a predaceous alley cat.

The Indifferent Lizards

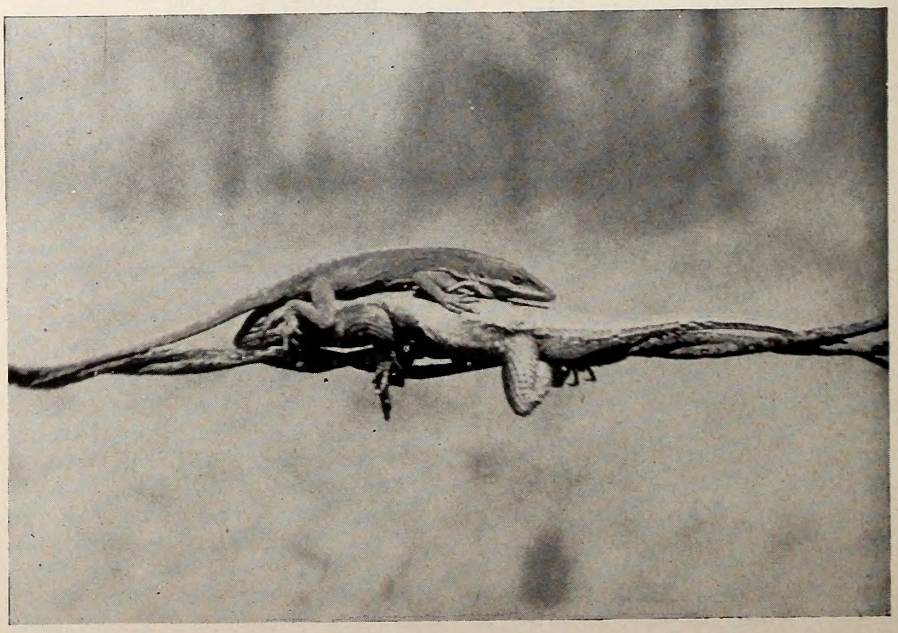
One day in early spring while searching the edge of an overgrown pasture for any denizen that might fall as easy prey to my camera, I discovered an American Chameleon (*Anolis carolinensis* Voight) that was serenely basking on a fence post in the warm sunlight. A picture was in the offing, for the lizard did not seem alarmed by my presence.

While adjusting my camera, I noticed a Fence lizard (*Sceloporus undulatus* Latreille) clinging to the next post. Being more awake than the first, it nervously moved around the post and out of my sight.

"Why not photograph the lizards together?" I thought. "Maybe the result will be a woodland duel"

After listening to my plan, my companion managed to coax the chameleon, without greatly alarming it, onto the top strand of barb wire. The other lizard was somewhat more difficult to handle, but was finally persuaded to crawl along the wire in the direction of the chameleon. With camera ready, I waited for the two to meet. The two lizards touched noses, and became rigid. In a few moments, the chameleon raised its head, looked about, and then nonchantly crawled over the back of the larger reptile to continue on its way. The tolerant Fence Lizard did not offer any resistance against the maneuver.

To our disappointment, no action resulted, not even a dewlap was inflated.



Al Day's Waterfowl Scorecard Report

Reports on Last Fall's Shooting were Scarce

By Albert M. Day

Duck hunters must be pen shy!

Only one-tenth of one per cent of the 1947 duck stamp buyers could be induced to fill out and mail a simple report. It seems incredible that such a vociferous lot should pass up this golden opportunity to register hits, misses and gripes. But from duck stamp sales amounting to more than one and three-quarter millions, only 1,962 scorecards were received.

Sporting and conservation magazines did a splendid job, frequently at the sacrifice of paid advertising. To them the Fish and Wildlife Service is sincerely thankful — not only for repeated printing of the scorecard but for the fine editorial comment urging all waterfowlers to make the report for their own good. But the response was disappointing beyond belief—one out of a thousand.

Here was their chance to stand up and be counted; to register protests, make suggestions, help regulate their sport. To the "corporal's guard" who took pen in hand, the Service expresses its obligation. It is gratifying to get even a little help on a job as big as the management of our migratory waterfowl.

Fortunately, the Fish and Wildlife Service had inaugurated a check system to furnish supplementary information by personal contact through random telephone calls. In this way nearly 9,000 stamp purchasers in 32 states were interviewed by Service personnel or coöperators.

The 1,962 hunters who sent in scorecards, reported bagging 30,214 birds, and the loss of 4,412 cripples or unretrieved ducks and geese. They had a daily average of 1.8 and a seasonal average of 15.4 birds. About two-thirds (1,323) hunted on public areas, 561 shot on private grounds while only 78 patronized the so-called commercial "clubs."

The scorecards received, although showing an average daily bag of 1.8 birds, were apparently sent in chiefly by the more persistent hunters who were in the field enough times to bring in an average seasonal bag of 15.4. The significance of this is brought out by analysis of the 8,845 personal interviews with duck stamp purchasers. Of these, 1,193 or 13.5 per cent did not hunt at all, leaving 7,652 who did.

On the basis of the figures furnished, these hunters averaged only 7.3 birds for the season but their average daily bag was 1.82 or within a minute fraction of the average shown by the scorecards. The average number of days spent afield by this group was, however, only about one-half the number reported on the scorecards which is obviously the reason for the difference in the average season bag.

As stated above, the telephone sampling revealed the fact that about 13.5 per cent of the duck stamp purchasers did not hunt. Included in these are the philatelists as well as those who intended to hunt but for one reason or another were unable to do so. Interviews indicated that there were many of these, but no attempt was made to establish a percentage. Nevertheless, on the other side of the ledger there are an unknown number of hunters who, under the law, are not required to buy stamps (boys under 16) and, of course, those who illegally hunted without a stamp. Although the total number of these two classes is not known, there is reason to believe that the first category is large since there is increased interest among older sportsmen to "take a boy hunting or fishing."

Computations based upon the analyses of kill from these two studies, augmented in some cases by information collected by the State game departments and others, and included with other data available to the Service, permits the following flyway comparisons for the 1946 and 1947 seasons.

Analysis shows that (1) Continental waterfowl populations were about the same for the 1946 and 1947 seasons, (2) Smaller numbers of duck hunters were afield, and (3) Percentage of kill increased in the Mississippi Flyway.

Scorecard data were valuable and helpful. We wish there had been a hundred times the small number received.

	Atlantic Flyway		Mississippi Flyway		Central Flyway		Pacific Flyway	
	1946	1947	1946	1947	1946	1947	1946	1947
	%	%	%	%	%	%	%	%
Waterfowl	15	15	25	25	33	23	27	37
Duck Stamps	14	11	42	44	25	25	19	20
Kill	9	10	37	46	29	19	25	25

WILDLIFE AND THE LAND

(*Continued from page seven*)

they must be hulled, cleaned, and scarified. When these processes have been completed, the seeds are packaged and sent free of charge to farmers who have agreed to plant them.

Lespedeza plantings require little care except for an occasional fertilization and cutting back to encourage new growth. Since it is a perennial, Lespedeza forms a permanent quail habitat once it has become established.

The Wildlife Resources Commission obtains seeds from a 10-acre seed plot owned by the State, and purchases seeds from farmers who maintain seed producing plots. The use of small Lespedeza plants instead of seeds has also been proven highly successful. Field borders planted to seedlings will produce quail food the following fall, whereas two years are required to produce food from borders planted to seeds.

Although both Lespedeza species produce seeds, bicolor is the variety which produces quail food. The seeds of sericea are extremely hard and cannot be digested by the birds. Its most important benefit is to provide nesting cover.

Figures are not available as to the increase in quail production as a result of the Lespedeza planting program, but the Wildlife Resources Commission believes that the over-all program is producing a noticeable increase in the hunter's game bags.

How Rich Will We Be?

By Tom Wallace

Editor, *The Louisville Times*
and
Past National President, Izaak Walton League of America

The question asked by J. N. Darling, famous cartoonist and conservationist, in the cartoon published with this article deserves more widespread and serious consideration than, perhaps, it will receive.

Millions, scores of millions, more than 100,000,000 people in the United States, have so little information about natural resources that they fondly imagine that these of the United States are inexhaustible.

That is far from being true and while we consider, gayly or glumly, according to our political beliefs or the degree of our bouyancy, giving billions to needy countries, there is too little consideration of the problem of where we shall get, regularly, and eternally, the means to provide for the needs of others and for ourselves.

The United States is richer in money than it was a generation ago, three or four or more generations ago; immensely richer than it was when its resources hardly had been scratched, but it is not safely and indestructibly rich. It has before it choice between a more vigorous movement to correct abuses of soil and water and loss of its financial strength.

Mr. Darling mentions forests and soil and water. The resource last mentioned has been called by Kenneth Reid, Executive Secretary of the Izaak Walton League of America, the stepchild of conservation.

Not many people know anything about water as a natural resource, and how it has been mistreated and still is mistreated. Nearly everyone knows a little—not much — about forests and farm lands, but nearly everyone omits thinking about water. People complacently eat shellfish without knowing that some of our ocean estuaries, scenes of great enterprises, are being ruined by pollution.

The spectacle of farmers hauling water from the deeper holes in creeks which have stopped running because of drouth excites comment. People say the farmer should arrange for water storage, and he should do that, but creeks and springs which flowed all of the year when the pioneers explored the continent no longer are dependable because the water table has descended. In almost any group of 100 persons, if the group is not made up of scientists or conservationists, mention of the water table mystifies more than half of the group; more than fifty persons wonder if a new mechanical gadget is being mentioned.

Yet the course of every individual who operates a farm affects in some degree the water table—the depth at which ground water is available. Not many agricultural agents, graduated from colleges to become guides of farmers, pay much attention to water pollution or water depletion.

Not many people know that because land is abused high dams built to irrigate land, to create electric power, to control floods, will become useless for the purposes for which they are created unless the problem of siltation is controlled. The local board of trade, in any town surrounded by eroded hills and living upon the fertile soil of stream valleys, is ready to whoop for the high dams on which many millions of dollars will be spent, entirely ignoring the fact that the dam that will submerge 1,000 miles of fertile valley soil will be useless within less than a century because of the silt that will fill the reservoir.

Mr. Darling, the cartoonist, is much more of a statesman than the United States Senator who has some friends who wish to exploit a virgin forest which the Federal Government has been protecting. He is more of a patriot than the Senator who wants to get money from the Federal Treasury spent on a series of dams which aren't really needed now and which may be entirely filled with sand, clay, gravel, and trash before the Senator's grandson is graduated from college.

How rich will we be when we have converted all our forests, all our soil, all our water resources and our minerals into cash? Ask King Midas—he found out!

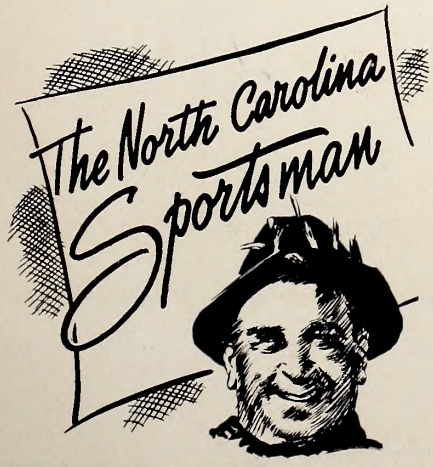
LAKE WACCAMAW

(Continued from page six)

production of animal proteins in the lake, food habits, change in food preferences with change in size, how effectively the food supply of the lake is being utilized, etc. On presumptive evidence it is believed that the quantity of small life in the lake could support a larger population of fish than is there now. This means that some factor other than the basic food supply is limiting the number of fish, and this factor may well be the amount of cover and protection from large fish which the small fish are able to find. Further discussion of these problems will be taken up in the report on the fish populations of these lakes.

Table I. Average abundance of bottom organisms from Lake Waccamaw, based on 28 samples collected in August, 1947. Figures are numbers of animals per square meter of bottom.

Organism		No. per sq. meter
molluscs		208
mussels	40	
snails	168	
segmented worms (3 species)		179
leeches		14
round worms		4
scuds		11
insects		160
mayfly nymphs	106	
midge larvae	23	
caddis flies	17	
phantom larvae and pupae	9	
orl fly larvae	2	
dragon fly nymphs	2	
ceratopogonids	1	
Total		579



The September issue will have a section devoted to sportsmen and sportsmen's clubs.

Land Planning Trebles Wildlife Acreage

Sound land-use planning under the nation-wide soil conservation program, while greatly increasing crop yields and soil productivity, has nearly trebled the total amount of land available for wildlife use on coöperating farms throughout the country, the Wildlife Management Institute reported today.

Border strips add to wildlife acreage.

A classification table of planned land-use areas in soil conservation districts as of December 31, 1947, compiled by the Soil Conservation Service shows that the total acreage devoted to wildlife increased from 332,008 acres before planning to 708,657 acres—a gain of 113.45 per cent—and that the acreage devoted to permanent hay increased from 2,455,968 to 6,125,557 acres—a gain of 149.41 per cent. Hayfields are the principal nesting grounds of the pheasant and the cottontail and are used as feeding places by many other farm-game species.

Acreage figures alone, however, do not reflect all of the increased benefits that land planning gives to farm game. The millions of miles of "edge" created by terraces and contour farming, the thousands of miles of multiflora rose "living fences," and the myriads of farm ponds and fenced and reseeded gullies created under the soil conservation program have values to wildlife that are virtually immeasurable.

Local soil conservation districts now embrace 148,217,770 acres under 529,951 active soil conservation plans. The total area, if applied to a single unbroken region, would blanket nearly the whole state of Texas. Increased productivity of planned lands in crops, wood products, and wildlife is gaining new converts to the soil conservation program daily. Between June 30 and December 31, 1947, a total of 6,362,165 new acres were brought under planning in established soil conservation districts.

The stimulating effects to future wildlife populations of an expanding program of this magnitude are tremendous. On a national scale wildlife must be considered as a by-product of agriculture and forestry. Farm lands that are too infertile to produce crops or worth-while timber stands must be regarded as poor wildlife lands. Farms so poorly planned and managed that the topsoil is damaged by erosion, over-grazing, and unnecessary burning, may be expected to support minimum game populations.

* * * * *

The starling owes its widespread existence in the United States to a wind storm. Several specimens were kept in captivity in a New York zoo until a severe wind storm broke their cages and released them. Since that time they have made a nuisance of themselves throughout nearly all 48 states.

* * * * *

The English sparrow is not a sparrow but a member of the weaver bird family. They were introduced into the United States during the 18th Century, and have become a pest throughout the country.

Watch for a special section devoted to women's activities in conservation to begin in a fall issue.

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Carrie L. Broughton
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"A sportsman is a gentleman. Be a sportsman and ask permission of the landowner before going on his land to fish or hunt.". . . But let's not over-do it. Farmers produce the game, and like to have some left for themselves.